Northern Rockies Weather Watch
NWS Missoula, Montana
Spring 2007

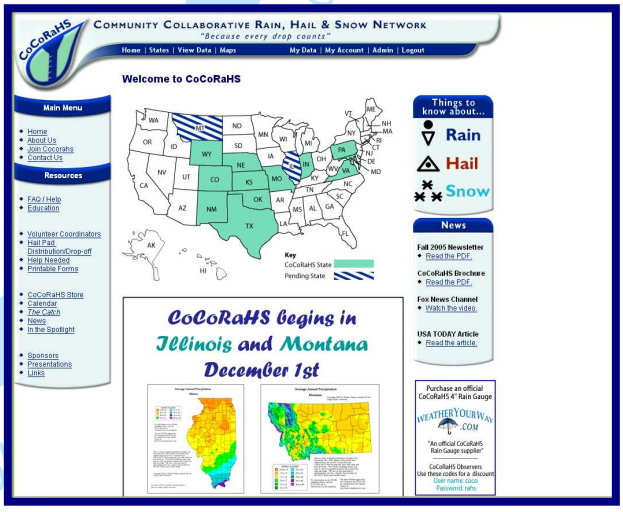
Introducing
CoCoRaHS and Snowfall Reporter

The National Weather Service in Missoula is looking to enhance its severe weather spotter network by introducing two new volunteer programs: The Community Collaborative Rain, Hail, and Snow Network "CoCoRaHS" and "Snowfall Reporter." In addition to being a severe weather spotter, we would like you to consider volunteering for either one of these great programs to assist us in the accomplishment of our mission which is to protect lives through accurate weather forecasts and warnings as well as through real time severe weather reports.

The CoCoRaHS program is a unique, non-profit, community-based, high density network of volunteers who take daily measurements of rain, hail, and snow in their backyards and record the information onto the CoCoRaHS web site. Observations are immediately available in map and table form for the National Weather Service and the public to view. The program was born in 1998 with a few dozen volunteers in Colorado. As more volunteers were recruited, enough data became available to generate rainfall maps for every passing weather system or storm. The new data uncovered fascinating local patterns that were valuable both for the National Weather Service and local residents. CoCoRaHS continues to grow and now has thousands of volunteers. The State of Montana has just recently been added to the program with Northern Ag Network Weathercaster John Pulasky heading the program with support from the National Weather Service office's across Montana. We encourage you to first read more information about this program at www.cocorahs.org before making a decision on whether or not to volunteer. The program is in its infancy for Montana, so training and equipment will be forth coming early next year. We hope to expand the program into Idaho later this year.

A Snowfall Reporter simply volunteers to contact our office whenever one inch of snow is received within a 24-hour period. That's it! In a nutshell, all you have to do is just add the snowfall reporting to your current severe weather spotter duties.

If you are interested in volunteering for either one of these programs, please contact us at peter.felsch@noaa.gov or you by phone at 406-329-4715. Ask for Peter, Bryan or Trent.



Assessing Services and Building Partnerships in North Central Idaho

WFO Missoula, Montana, has just concluded phase three of a multi-year service assessment to area communities. The targets of this latest phase were Grangeville and Orofino, Idaho. Surrounding communities were also assessed. Much like phases one and two, which were centered on Kalispell and Butte/Anaconda, Montana, the primary objectives were to determine customer's needs, evaluate the communities' perception of the National Weather Service, and to assess the quality of products and services rendered. A special emphasis was placed on developing and enhancing partnerships. This added emphasis was based on a need to enhance the communication of weather information across the sparsely populated areas that surround both communities.

To complete the task, the following strategy was developed. Team members developed a master list that contained contact information for weather spotters, Government agencies, emergency management, law enforcement offices, road departments, media outlets, school districts/schools, and private businesses. Teams of two individuals were sent out on two-day trips to meet with the our customers. Existing partners were asked questions aimed at determining our forecast biases, perception of product and service quality, website utilization, and overall perception of the NWS. New partners were asked questions that targeted their needs. Following this, they were shown NWS website capabilities with the focus set on meeting their needs. Given the numerous microclimates found across central Idaho, both sets of partners were asked questions about local, mainly terrain induced weather and flooding that affects the area (i.e. downslope wind storms and canyon winds, smoke dispersion during fire season, high impact areas during snow events, flash floods, debris flows, etc.)

Customers told team members about the poor air quality conditions are normally experienced during fire season.

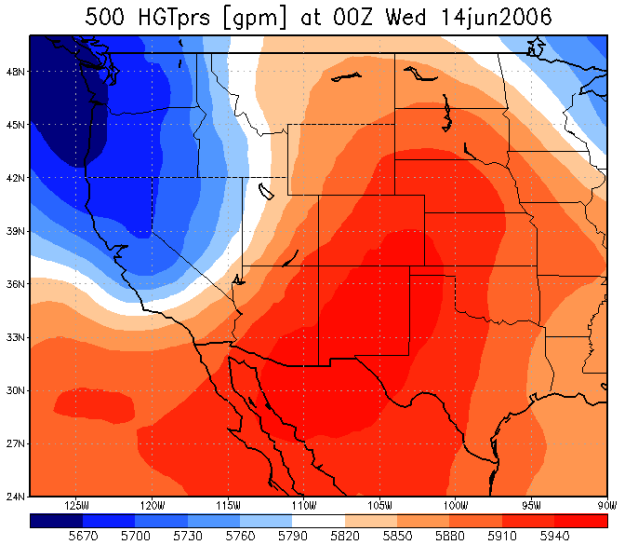
Much useful information was gained during this project. New customer needs were identified, forecast biases were uncovered and addressed, and the overall knowledge of the area was enhanced. If you are interested in having us conduct a service assessment in your area in the future, or if you have any feed back on the quality of services rendered in your area, please feel free to contact Bryan Henry at Bryan.Henry@noaa.gov. We would appreciate hearing from you as we strive to provide the best quality of service possible for you our customers.

Remembering the Severe Thunderstorm Outbreaks of June 12 and 13, 2006

How did this event evolve and what made it different than a typical, non severe thunderstorm event? Three ingredients are needed for thunderstorms to develop: a moisture source (in this case the Pacific Ocean), atmospheric instability and a lifting mechanism (like a cold front.) In most cases when significant, organized thunderstorm development occurs or is expected, wind shear is often present. Wind shear can be defined as changes in wind speed and/or direction with increasing height through the atmosphere. When all four ingredients are present, then organized severe thunderstorm activity is possible. This is exactly what happened on those days.

On June 12 and June 13, a strong upper level trough of low pressure located along the coast began to move inland and into the Columbia basin of Washington and Oregon. As it did so, a deep plume of moisture moved northeast into the area. The moisture plume interacted with warm and unstable air positioned over the area. As the day progressed, atmospheric instability increased. By mid afternoon, storms began developing across north central Idaho and moved northeast into Western Montana. The storms began to interact with strengthening middle and upper level winds. A few of these storms to developed into supercells. By late evening, several reports of golf-ball sized hail had been received from Mineral, Sanders and Lake counties. This was round one.

Round two began as the upper level trough of low pressure approached northern Idaho and Western Montana the next day. The associated cold front intensified to the southwest and began its approach. Once again, daytime heating led to an increase in the atmospheric instability ahead of the cold front. The increasing instability was further aided by cooling temperatures in the atmosphere's upper levels. As was the case the previous day, the middle and upper level wind flow and wind shear intensified in the afternoon. The combination of Pacific moisture, atmospheric instability (from intense surface heating and cooling in the upper levels), frontal lift and strong wind shear led to a second, stronger severe thunderstorm outbreak. The location of the severe thunderstorm activity on the 13th overlapped the location of the activity from the previous day. Once again, several large to giant sized hail reports were received. One USFS employee reported a hail stone that measured 2 ¼" near Alberton!



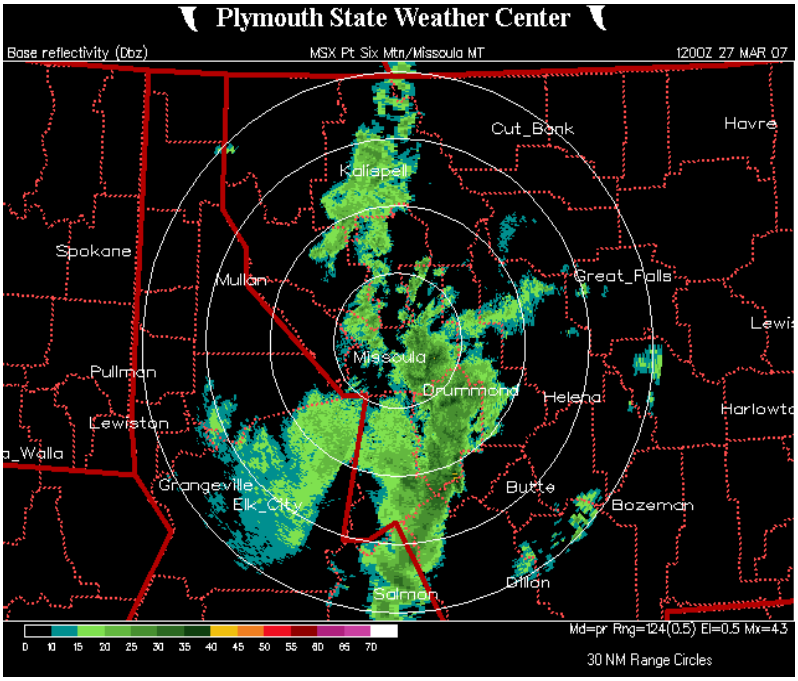
The image above shows the strong upper level trough (in blue) approaching the region from the west on the afternoon of the 13th

A total of 28 severe thunderstorm warnings were issued on the afternoons of June 12 and 13, 2006. During that same period, storm spotters like you phoned in 22 hail reports. Thank you for your proactivity during this event. Your timely reports helped us get the word out to the people who needed the information most—those who were in the path of the dangerous storms.

Winter Storm Impacts the Area

The passage of a closed upper level low pressure system, in combination with a surface cold front, created widespread mountain snow and valley rain across southwest Montana and central Idaho beginning the morning of March 27. Snow levels remained near 4000 feet, so lower valley locations received precipitation in the form of a much needed wetting rain. This was the wettest day of March across the region.

The upper level low developed and tracked across central Idaho and southwest Montana. This is a typical pattern for spring time mountain snows across southwest Montana. Heavy snow warnings were issued for the Bitterroot, Sapphire, and the Pintlar Mountains of southwest Montana and the southern Clearwater Mountains of central Idaho. The Georgetown Lake area (6000 feet) seemed to be hardest hit by this system with a location near the lake reporting 17" of snow! Other areas impacted included Lost Trail Pass, which was closed except for emergency travel due to heavy snow and lowered visibilities.



Radar image from 6 am on March 27. Notice a large swath of precipitation between Drummond and Butte. Darker greens represent heavier precipitation.

Location	Elevation	Total Measured Snowfall
Georgetown Lake, MT	6470 ft	17"
Saddle Mountain, MT	7900 ft	12"
Discovery Ski, MT	6480 ft	10"
Skalkaho Summit, MT	7251 ft	8"
Nez Perce Camp, MT	5640 ft	4"
Butte, MT	5590 ft	1"

Monthly Summary for Missoula
March 2007

Snowpack in the Pintlers, above, was near normal. By late March, most mountain locations were only 75-80 percent of normal.

March continued the trend for 2007, drier and warmer than normal. Several records were broken across the area. Lack of snowfall was evident in Missoula. There was only one day of measurable snowfall at the airport, and that occurred on the 1st.

The winter season of 2006-2007 has been the 2nd least snowy season on record (reliable records have been recorded since 1948 at the Missoula airport). Only 19.6 inches of snow has fallen this season. 1980 was the least snowy season with 14.5" at the Missoula airport. The highest temperature in March was 71 degrees on March 17 and 24 with the lowest temperature of 14 F occurring on the 1st. Record high minimum temperatures were also recorded. The following is a summary of the weather which occurred in Missoula last month.

March 1 through 3: Temperatures were 5.6 degrees below normal at the Missoula Airport. The month's only snowfall occurred on the 1st (0.5"). The coldest day of the month (14 deg F) occurred on the morning of the 3rd) as the season's last arctic air invaded the region.

March 4 – 26: This 3-week period was the warmest of any March on record. The average temperature was 44.8 deg F (7.5 degrees above normal). The second warmest 3 week period was set in 1910. Big changes occurred in this 3-week period at the Missoula Airport. The region was dominated most of the time by a high pressure ridge. Warm temperatures, shorter nights and the lack of moisture/snow on the ground, prevented strong valley inversions, thus valley fog was limited.

March 27: An upper level closed low pressure system moved over the region and produced a generous amount of precipitation, the biggest event in all of March. Georgetown Lake recorded 17 inches of snow. Lost trail pass recorded nearly 8 inches of snow. Precipitation remained liquid in Missoula with .10 inches of rainfall. Some of the foothills and benches in the Missoula and Bitterroot valley, around 4000 feet, had up to an inch of snow. Temperatures were much cooler and remained in the upper 30's and lower 40's most of the day at the Missoula Airport. A slow moving closed upper low pressure system is a typical weather pattern which produces most of the spring time precipitation in western Montana. This storm produced blizzard conditions in eastern Montana on the 28th as it slowly moved to the east. See storm of the month for further information.

March 28 through 31: In the final days of the month a weak westerly flow produced near normal temperatures and dry weather.

The month of March ended up being the 3rd warmest and 11th driest on record dating back to 1893.

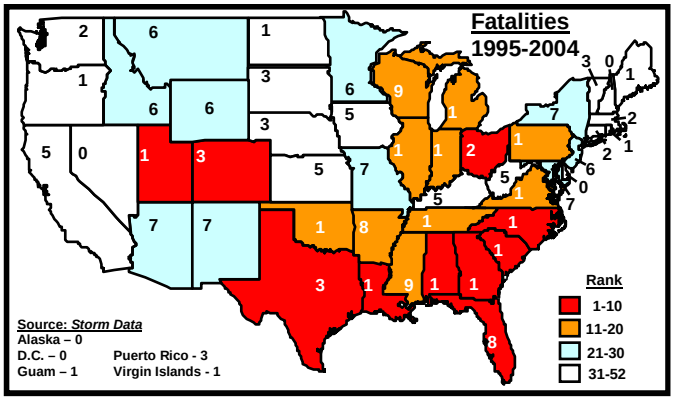
Spotter Quiz

1. Which of the following weather phenomena needs to be reported to the National Weather Service when observed?
   - A.) Unforecasted Weather
   - B.) Dense Fog (reducing visibilities to ¼ mile or less)
   - C.) Hail (any size)
   - D.) Winds that are greater than or equal to 40 mph (including gusts)
   - E.) All of the above
2. What was the size of biggest hail stone that fell in western Montana in 2006?
   - A.) 1 inch
   - B.) ¾ of an inch
   - C.) 2 ¼ inches
   - D.) 1 ¾ inches
   - E.) 2 ½ inches
3. True or False. Hot air is heavier than cold air.
4. The type of cloud that a tornado forms in is called…
   - A.) A cirrus cloud
   - B.) A lenticular cloud
   - C.) A roll cloud
   - D.) A cumulonimbus
   - E.) A nimbostratus cloud
5. Shelf Clouds are an indicator of (choose the best answer)…
   - A.) Strong thunderstorm downdrafts
   - B.) Strong thunderstorm updrafts
   - C.) Strong rotation
   - D.) Very large hail
6. Wall Clouds are an indicator of (chose the best answer)…
   - A.) Strong thunderstorm downdrafts
   - B.) Strong thunderstorm updrafts
   - C.) Possible tornadic weather
   - D.) Probable severe thunderstorm activity (High winds, Tornadic Weather, and/or Hail)
   - E.) All of the above except A.
7. Which one of the following is **not** a necessary ingredient for thunderstorm formation?
   - A.) A Moisture Source
   - B.) Atmospheric Instability
   - C.) Wind Shear
   - D.) A source of lift (frontal boundary, mountainous terrain, etc.)
8. True or False. Tornadic activity was reported in Western Montana (west of the Continental Divide) in 2006.
9. Which of the following were reported by weather spotters in 2006?
   - A.) Golf ball to Baseball sized hail
   - B.) Multiple funnel clouds over Flathead lake
   - C.) Dry microbursts
   - D.) Flash Flooding
   - E.) All of the above

Answers: 1:E , 2: C (near Alberton), 3: F, 4:D, 5:A, 6:B, 7:C, 8:T (zWaterspouts over Flathead Lake and a Gustnado near Deer Lodge), 9:E

Lightning Safety

Each year lightning claims nearly 100 lives. Furthermore, research shows that roughly an additional 540 individuals are injured from lightning strikes annually. Most deaths are due to cardiopulmonary arrest. Lightning strike survivors often experience life-altering effects. Victims often receive injuries that are neurological in nature. Varying degrees of brain and/or spinal chord damage are often received. Victims may have difficulty ordering tasks, become prone to seizures or may experience a change in personality. Some may begin to experience periods of isolation or depression. Though the medical community does not yet have a total grasp of the effects of lightning on the human body, they have noticed that these impacts tend to grow worse as the years pass.

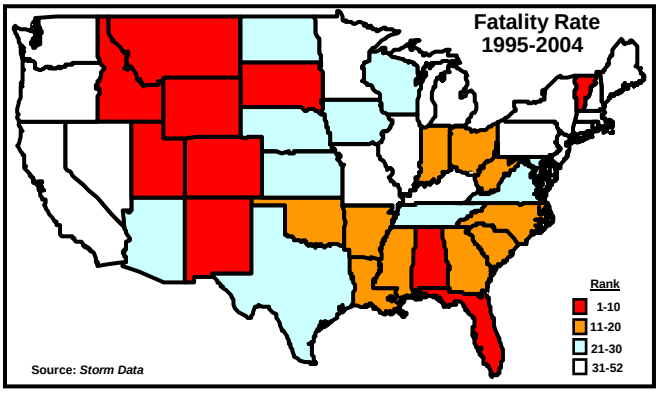


Lightning deaths by state 1995-2004

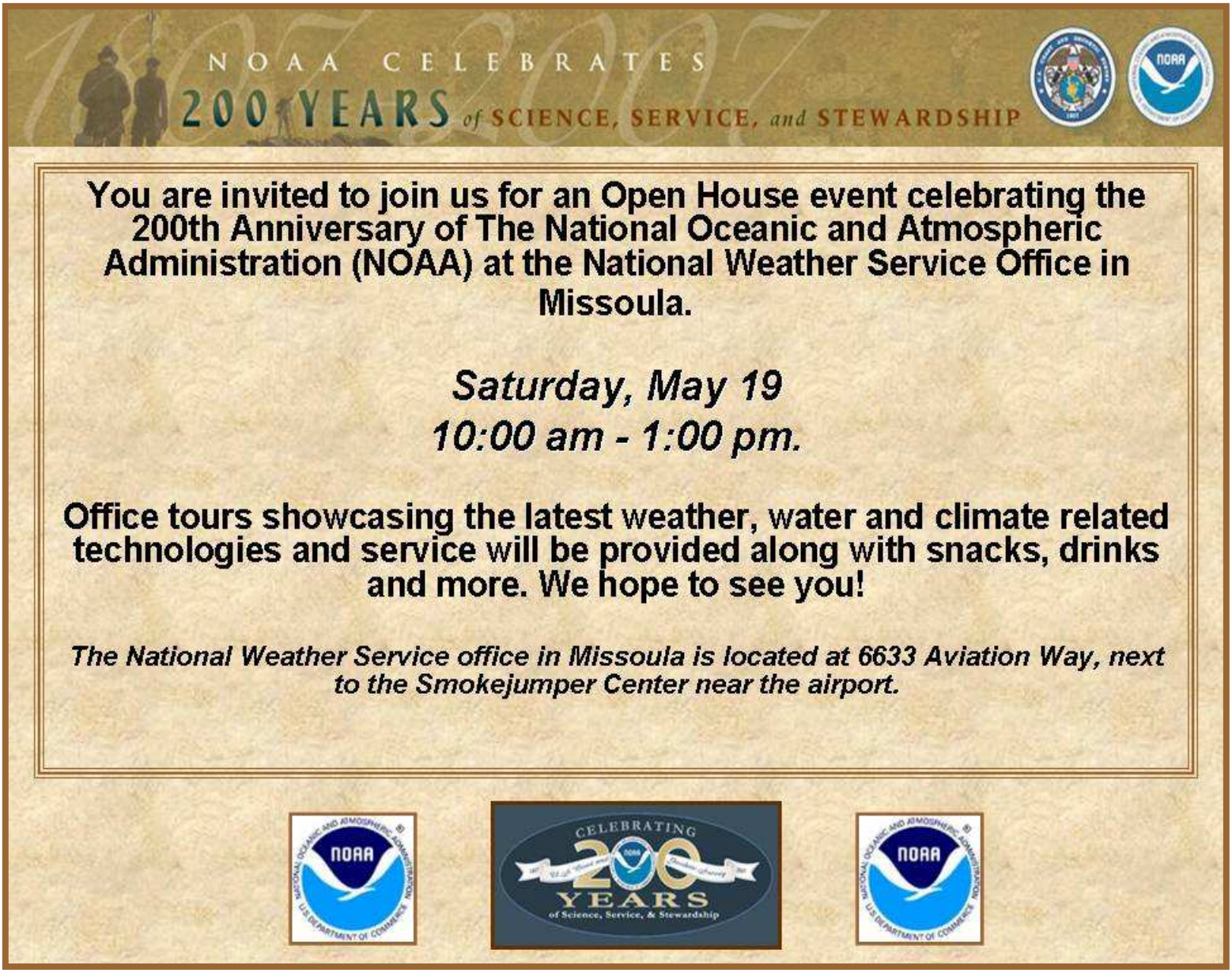
So, what can be done to lessen the chance of becoming a lightning strike victim? The first thing to realize is that outdoor areas are unsafe locations to be during thunderstorms. Inside is the best place to be. Once inside, stay away from windows and doors. Metal frames can carry electricity if the building is struck, and broken glass may fly through the air if the window breaks. Avoid talking on the telephone; current can travel through telephone lines. Stay away from anything wet, since water conducts electricity.

What if it is not possible to get indoors? The key is to avoid being the tallest object around or being next to the tallest object around. If possible, get inside a hard-topped automobile and move away from the metal frame toward the center of the vehicle. If the vehicle is struck, the electrical current will travel through the automobile's frame and into the ground. If the shelter of a vehicle is not readily available, avoid being next to or underneath metal structures or trees. This includes being underneath a pavilion. Pavilions often have iron cables that run through the concrete slabs. These cables can serve as electrical conductors. Also, the electricity may arc between the metal posts that hold the structure up. Lightning always seeks the shortest route to the ground. Most often this involves striking the tallest object around. Usually this is a tree. If you are on a hill or a mountain, avoid the ridge top. Find a grassy area on a mid slope or at the bottom. Kneel down and cover your head. If your backpack has a metal frame, take it off. Do not lie down on wet ground. If caught out on a lake during a thunderstorm, get to shore as quickly as possible and out of the boat.

Finally, keep in mind the 30/30 rule. It states that people should seek shelter if the "Flash-To-Bang" delay (length of time in seconds between a lightning flash and its subsequent thunder), is 30 seconds or less, and that they remain under cover until 30 minutes after the final clap of thunder.
A 30 second lead time is necessary prior to a storm's arrival because of the possibility of distant strikes. A 30 minute wait after the last thunder is heard is necessary because the trailing storm clouds still carry a lingering charge. This charge can and does occasionally produce lightning on the back edge of a storm, several minutes after the rain has ended.



Lightning strikes in Montana and Idaho are more lethal than in most other parts of the country.



Now is the time to Schedule your Spring/Summer Spotter Training sessions. Please contact either Peter Felsch or Bryan Henry by phone at:
(406) 329-4840
or by email at:
Peter.Felsch@noaa.gov or Bryan.Henry@noaa.gov

We Need To Hear From You

1-800-626-6975 (day and night)

- Tornado, funnel cloud and waterspout
- Winds - estimated or measured >40 mph
- Heavy rain - ½” or more per hour
- Flooding - of any kind
- Hail - any size
- Visibility reduced to less than ¼ mile
- Heavy snow - one inch or more per hour
- Freezing Rain or Drizzle
- Weather related damage or injuries
- Weather related road closures
- **Unforecasted weather**